TOBACCO INDUSTRY RESEARCH COMMITTEE

TIRC Grant #134R1

CONFIDENTIAL

Tissue Culture Association
Dr. Hans Ris, University of
Wisconsin, Madison, Wisconsin

Final Report

REPORT OF THE COURSE IN THE PRINCIPLES AND TECHNIQUES OF TISSUE CULTURE, 1960

General

The Tissue Culture Association sponsored a summer course in "The Principles and Techniques of Tissue Culture" at the University of Wisconsin, Madison, Wisconsin, from June 20 to July 15, 1960. Transfer of the Course from Denver, where it was previously located, to Madison was carried out smoothly thanks to the cooperation of the faculty at Denver and the administration in Wisconsin. In particular, we were indebted to Dr. Hans Ris of the Department of Zoology in the University of Wisconsin, who has acted as our Sponsor this year, and who has been extremely helpful in assisting us in setting up the Course in new surroundings.

This year two major changes were introduced to the general arrangements. Whereas previously fifteen full-time students had been accepted and another fifteen places were filled by auditors, on this occasion all thirty participants were accepted as working members. This necessitated the purchase of a considerable amount of new apparatus and equipment and also placed more strain on the laboratory staff. In view of the increased number of working students, it may be desirable in future years to increase the laboratory staff. However, the experiment proved to be fully justified insofar as a more homogeneous teaching program became possible. The other major change related to the manner of staffing. In previous years, it had been customary to have the entire staff present throughout the Course. This year more Associates were invited to participate for shorter periods. Thus, instead of retaining three Associates for the whole Course, we had a total of eight Associates, two of whom were present at any time. This enabled us to present the students with a greater range of authoritative instruction and also to bring fresh enthusiasm into the teaching each week.

In other respects, the plan of instruction followed that established in previous years and constituted an intensive four-week course in the principles and techniques of tissue culture with particular emphasis on their application in research in fields of cell biology. The course of instruction included practice in all aspects of cell and tissue culture technique, and detailed consideration of the structure and function of living cells.

Morning sessions were devoted to lectures, discussions, demonstrations and practical laboratory exercises. As in 1959, these were designed as experiments to illustrate principles of cell biology. In the afternoons, opportunities were available to participate in research projects, special studies such as time-lapse cinemicrography, optical methods, and conferences with staff and visiting scientists. The evening lectures, Monday through Friday, were presented by members of the faculty and by a number of distinguished guest lecturers, selected to cover most aspects of current research in cell biology. Copies of the laboratory schedule and a list of evening lectures are appended.

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During the first week of the Course, emphasis was placed on basic methods for tissue and organ culture, especially in morphology and experimental embryology. The exercises included primary explanation techniques, organ cultures, disaggregation and reaggregation techniques, and whole embryo culture. During this week, Dr. Margaret Murray and Dr. Tom Algard were present as Associates in charge of teaching special subjects. In the second week, cell culture techniques were taught. These included methods for handling cell strains and methods for using them in quantitative studies. At the same time, instruction in the application of cell cultures to cytogenetic studies and virology were emphasized. Dr. Frank Ruddle and Dr. Calderon Howe were present as Associates during this week and took charge of instruction in their own special fields. During the third week, emphasis was placed on analytical methods applicable to tissue culture and, in particular, histochemistry and biochemistry. Dr. Hewson Swift conducted instruction in histochemistry, while Dr. William Rutter supervised instruction in biochemical methods of analysis. The final week of the Course dealt mainly with organizational problems and with the individual student's own research projects. Dr. Philip Marcus joined the staff during this time to participate in these discussions.

Personnel

Lists of staff members and visiting lecturers, including their institutional connections, are appended.

We were fortunate in having the enthusiastic cooperation of a great many members of the University staff, in addition to our own personnel. In particular, Dean Robert Doremus extended help and advice which were greatly valued. Dr. Hans Ris, of the Department of Zoology, was the official Sponsor of the Course and provided liaison with the University administration. Dr. Ris also made arrangements for our accommodations and helped us in a great many ways. His enthusiastic support of this project contributed greatly to its success. We are also grateful to Dr. Robert Auerbach of the Zoology Department, who placed incubator facilities at our disposal. Throughout the Course we encouraged cooperation with the staff of the University of Wisconsin and the McArdle Laboratories and had a very friendly and profitable relationship with them. Members of the University staff who joined in our discussions included Dr. Ris, Dr. Van Potter, Dr. Lardy, Dr. Auerbach, Dr. Halvorson, Dr. Szybalski, Dr. Patau, and Dr. Swim.

The selection and recruitment of students was again in the hands of Dr. Mary Parshley, with the aid of Dr. Margaret Murray and Dr. Calderon Howe of the College of Physicians and Surgeons, New York. Once more about one hundred and fifty letters of inquiry were handled and between seventy and eighty applications were submitted. Dr. Parshley has informed us that already a number of applications have been received for next year's Course.

Students

A list of participants is appended. These came from sixteen different states, and there were, in addition, three students from Great Britain, one from Switzerland, and one from Australia. The primary interests of the group included microbiology and virology (11), biochemistry (6), embryology and morphogenesis (6), pathology and cancer (4), endocrinology (1), radiobiology (1), and genetics (1). This distribution was very similar to that in 1959, but it was apparent this year that the divisions between disciplines were becoming much less sharp. Many of the microbiologists and embryologists were in fact primarily interested in biochemical aspects of their fields, while in cancer research the role of viruses has become especially important within the past two years.

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Future Plans

During the Course its future was discussed by the Executive Council of the Tissue Culture Association. In view of the continued demand, in addition to the warm reception and evident appreciation of our activities by faculty members of the University of Wisconsin, it was decided that the Tissue Culture Association should continue to sponsor this project for a further period of five years and that an agreement with the University of Wisconsin for that period should be sought.

Summary

The Tissue Culture Course was this year transferred from Denver to the University of Wisconsin and benefited greatly by the improved facilities thereby made available. It was successful in its aim of providing post-graduate education in cell biology by means of instruction by a highly qualified staff and a distinguished group of guest lecturers. The participants were once more of unusually high quality. Almost three times as many applications were received as places were available. In view of the continued demand, the Tissue Culture Association Executive Council has decided that this training program should be continued for a further five years beyond the expiry of the present period.

FINANCIAL REPORT

Funds were available from collection of tuition fees ($100 per student) and from specific grants. An outright grant of $1,900.00 was received from the Tobacco Industry Research Committee for the purchase of two large incubators at $950.00 each.

It is my great pleasure to express to the Tobacco Industry Research Committee the deep appreciation of the Tissue Culture Association, the staff, and the students for its interest and the financial assistance that has been provided in this teaching program to investigators in cell biology.

Respectfully submitted

/s/ John Paul

John Paul, Director
Tissue Culture Course

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METHODS AND PRINCIPLES OF TISSUE CULTURE - STAFF - 1960

Director

Dr. John Paul
HERT Tissue Culture Laboratory
University of Glasgow
Glasgow, Scotland

Assistant Director

Dr. William G. Cooper
Department of Anatomy
University of Colorado Medical School
Denver, Colorado

Associates

First Week

Dr. Margaret R. Murray
Laboratory for Cell Physiology
College of Physicians and Surgeons
New York, New York

Dr. Thomas Algard
Department of Anatomy
Stanford University
Stanford, California

Second Week

Dr. Calderon Howe
Department of Microbiology
College of Physicians and Surgeons
New York City, New York

Dr. Frank Ruddle
Department of Zoology
University of California
Berkeley, California

Third Week

Dr. William J. Rutter
Department of Chemistry and
Chemical Engineering
University of Illinois
Urbana, Illinois

Dr. Hewson Swift
Department of Zoology
University of Chicago
Chicago, Illinois

Fourth Week

Dr. George O. Gey
Department of Surgery
The Johns Hopkins Hospital
Baltimore, Maryland

Dr. Philip I. Marcus
Department of Biophysics
University of Colorado Medical School
Denver, Colorado

Laboratory Assistants

Miss Marilyn Bozeman
Department of Virus and Rickettsial Diseases
Walter Reed Army Medical Center
Washington, D.C.

Mrs. Helena Benites
Laboratory for Cell Physiology
College of Physicians and Surgeons
New York City, New York

Miss I Withers
Department of Chemistry and Chemical
Engineering
University of Illinois
Urbana, Illinois

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Photographic Analyst

Mr. John D. Carnes
M.D. Anderson Hospital
Texas Medical Center
Houston, Texas

Service Assistants

Miss Jane Taplick
Mr. John Merriam

Secretary

Mrs. Sarah Hughes

Sponsor and Adviser at the University of Wisconsin

Dr. Hans Ris, Department of Zoology

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METHODS AND PRINCIPLES OF TISSUE CULTURE

PARTICIPANTS - 1960 -

Allan R. Beaudoin, Ph.D., University of Florida, Gainesville, Fla.
Dieter M. Burger, D.V.M., Washington State College of Veterinary Medicine, Pullman, Washington
Richard P. Bunge, M.D., University of Wisconsin, Madison, Wis.
Shu-Sing Cheng, Ph.D., University of North Carolina, Chapel Hill, N.C.
Lionel Crawford, Ph.D., California Institute of Technology, Pasadena, Cal.
William J. Culley, Ph.D., Muscatatuck State School, Indiana
Donald P. Durand, Ph.D., University of Missouri, Columbia, Mo.
Thomas Elsdale, Ph.D., University of Indiana, Bloomington, Indiana
James L. German, M.D., Rockefeller Institute, New York City, N.Y.
Robert E. Greefield, M.D., National Cancer Institute, Washington, D.C.
Robert Hadek, Ph.D., D.V.M., University of Chicago, Chicago, Ill.
R. H. Johnson, Dip. Bact., V.V.Sc., Veterinary Service, Nigeria
Igor Klatzo, M.D., National Institute for Neurological Diseases and Blindness, Washington, D.C.
Norman W. Klein, Ph.D., University of Connecticut, Storrs, Conn.
Dolores P. Lawlor, A.B., Delafield Hospital, New York City, N.Y.
Hans Loeffler, M.D., Children's Hospital, Philadelphia, Pa.
Joseph P. Lowenthal, D.Sc., Walter Reed Hospital, Washington, D.C.
Arlan McClurkin, Ph.D., U.S. Department of Agriculture, Iowa
Joseph H. McSweeney, Ph.D., Fordham University, New York City, N.Y.
Ruth C. Moore, M.Sc., Cancer Institute, Melbourne, Australia
Erich D. Ryll, M.D., M.A. Bact., Burke Army Hospital, San Antonio, Texas
William B. Savchuck, M.D., D.D.S., Pure Food and Drug Administration, Washington, D.C.
John J. Sciarra, M.D., College of Physicians and Surgeons, New York City, N.Y.
Vinod C. Shah, M.S., Columbia University, New York City, N.Y.
Eric J. Simon, Ph.D., New York University, Bellevue, New York City, N.Y.
Christopher P. Sword, Ph.D., University of Kansas, Lawrence, Kansas
Al Szulman, Ph.D., Boston Lying-In Hospital, Boston, Massachusetts
Harold M. M. Tovell, M.D., College of Physicians and Surgeons, New York City, N.Y.
Clarence J. Weinman, Ph.D., University of Florida, Gainesville, Fla.
Pauline J. Wood, Ph.D., University of Michigan, Ann Arbor, Mich.

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PROGRAM OF ACTIVITIES 1960

EVENING LECTURES

June 20	Dr. John Paul, Dept. of Biochemistry University of Glasgow, Scotland.	The cell and its environment.
June 21	Dr. Keith Porter, The Rockefeller Institute, New York City.	Cell ultrastructure.
* June 22	Dr. T. Algard, Dept. of Anatomy, Stanford University.	Some aspects of hormone action in vitro.
June 22	Dr. C. M. Pomerat, Dept. of Anatomy, University of Texas.	Dynamic morphology.
June 23	Dr. D. M. Prescott, Oak Ridge National Laboratory.	The growth cycle.
+ June 24	Dr. Honor B. Fell, Strangeways Laboratory, Cambridge, England.	Organ culture studies.
June 27	Dr. Margaret R. Murray, Laboratory for Cell Physiology, College of Physicians and Surgeons, New York City	Some problems of the nervous system approached through differentiating cultures.
June 28	Dr. George Yerganian, Children's Cancer Research Foundation, Inc., Boston.	Chromosomes of normal and malignant cells of the Chinese hamster.
June 29	Dr. F. Ruddle, Dept. of Zoology, University of California, Berkeley.	Chromosome variation in cell populations.
June 30	Dr. I. Lieberman, Dept. of Microbiology, University of Pittsburgh	Some aspects of cell nutrition.
* July 1	Dr. C. Howe, Dept. of Microbiology, College of Physicians and Surgeons, New York City	The erythrocyte as a reagent.
July 5	Dr. Hewson Swift, Dept. of Zoology, University of Chicago.	Cytochemical studies on giant chromosomes.
July 6	Dr. Richard A. Yates, E.I. DuPont de Nemours & Co., Wilmington, Delaware.	Feedback control of cell metabolism.
July 7	Dr. W. J. Rutter, Dept. of Chemistry and Chemical Engineering, University of Illinois	The metabolism of cell cultures.
* July 8	Dr. J. N. Davidson, Dept. of Biochemistry, University of Glasgow, Scotland.	Some biochemical aspects of growth.

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Program of Activities-Evening Lectures - 1960

† July 11	Dr. H. Toolan, Sloan-Kettering Institute, New York City.	Studies on tissue transplantation.
July 12	Dr. P. Marcus, Dept. of Biophysics, University of Colorado Medical School.	The nature of viruses.
July 13	Dr. William G. Cooper, Dept. of Anatomy, University of Colorado Medical School.	Some aspects of the behavior of muscle tissue in culture.

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TCC LABORATORY SCHEDULE June 1960

Meeting	Date		
1	20	Discussion:	Introduction of staff and students. General announcements. Review of Tissue Culture.
		Lab:	Preparation of embryo extract. Dissection of chick embryo. Set up chick explants in coverslip culture (Exp. 1).
2	21	Discussion:	Tissue Culture Media I.
		Lab:	Test tube cultures (Exp. 2).
3	22	Discussion:	Tissue Culture Media II.
		Lab:	Disaggregation of chick embryo muscle and preparation of replicate cultures (Exp. 3). Stain primary explants (Exp. 1).
4	23	Discussion:	Methods for the isolation of cells and tissues.
		Lab:	Set up organ cultures of skin with and without Vitamin A (Exp. 4). Set up reaggregation experiment (Exp. 5). Add tritiated thymidine and cytidine to cultures (Exp. 3).
5	24	Discussion:	Organ culture and related techniques.
		Lab:	Culture of whole chick embryos (Exp. 6). Transfer test tube cultures to Maximow slides (Exp. 2). Set up autoradiographs (Exp. 3).
6	25	Discussion:	Embryogenesis.
		Lab:	Examine embryo cultures (Exp. 6). Inspect cultures for reaggregation (Exp. 5).
7	27	Discussion:	Chromosome Cytology.
		Lab:	Phytohemagglutinin method for cytology of blood cells (Exp. 7). Wash Maximow slides (Exp. 2). Change organ cultures (Exp. 4).
		Afternoon:	Time-lapse cinemicrography.
8	28	Discussion:	Cell Strains.
		Lab:	Trypsinise HeLa. Plate out for clones (Exp. 8). Virus titration and neutralization (Exp. 9). Add colchicine to Maximow slides (Exp. 2).
		Afternoon:	Time-lapse cinemicrography.

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LABORATORY SCHEDULE

June 1960

Meeting	Date		
9	29	Discussion:	Aspects of Variation in Cell Populations.
		Lab:	Chromosome spreading and staining (Exp. 10). Fix Maximow slide preparations (Exp. 2).
		Afternoon:	Time-lapse cinemicrography.
10	30	Discussion:	Tissue Culture in Virology-I.
		Lab:	Stain phytohemagglutinin cultures (Exp. 7). Determine mitotic index (Exp. 2).
		Afternoon:	Time-lapse cinemicrography.
11	July 1	Discussion:	Tissue Culture in Virology-II.
		Lab:	Virus hemagglutination and hemadsorption (Exp. 9). Dulbecco plaque titration (Exp. 11).
		Afternoon:	Time-lapse cinemicrography.
12	5	Discussion:	Histochemical methods.
		Lab:	Set up test-tube cultures of L cells (Exp. 12). Set up explants of chick mesonephros (Exp. 13).
13	6	Discussion:	Cytochemical methods.
		Lab:	Section A - Metabolic experiment (Exp. 12). Section B - Histochemistry (Exp. 13). Section C - Tissue fractionation (Exp. 14).
14	7	Discussion:	Control of cell metabolism.
		Lab:	Section A - Histochemistry (Exp. 13). Section B - Tissue fractionation (Exp. 14). Section C - Metabolic experiment (Exp. 12).
15	8	Discussion:	Nucleocytoplasmic relationships.
		Lab:	Section A - Tissue fractionation (Exp. 14). Section B - Metabolic experiment (Exp. 12). Section C - Histochemistry (Exp. 13).
16	9	Discussion:	Differentiation and adaptation to environment. Review experiments.
		Lab:	Examine and stain clones (Exp. 8).
17	11	Discussion:	Laboratory organization. Sterilization materials and apparatus.

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TCC LABORATORY SCHEDULE July 1960

Meeting	Date		
18	12	Discussion group:	Morphology and differentiation.
19	13	Discussion group:	Microbiology.
		Afternoon:	Movies.
20	14	Discussion group:	Biochemistry, etc.
		Evening:	Graduation.

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